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REMARKS

Applicants previously presented claims 1 through 23 for examination. In the above-identified Office Action, the Examiner has (a) has rejected all of the claims; (b) has objected to the abstract because it was over 150 words; (c) has objected to figures 9E, 9F and 9G; and (d) has not lined through any of the references Applicants submitted, indicating that those references have been considered. Applicants appreciate the detailed suggestions given in the Office Action. For the reasons to be stated below, Applicants respectfully disagree with the objections and the rejections.

By this amendment, Applicants have (a) reduced the number of words in the abstract to be below 150; (b) amended claims 1, 5, 6, 7, 13-15, 16, and 18-23; (c) cancelled claims 4 and 17; and (d) added claim 24.

Accordingly, claims 1-3, 5-16 and 18-24 remain pending. Applicants respectfully request that the Examiner reconsider the application in light of the amendments and the remarks expressed herein.

Specification and drawings objections

The abstract was objected to because it was over 150 words. Applicants have reduced the number of words in the abstract to be below 150 words.

Figures 9E to 9G were objected to because they allegedly failed to show the audio output beam patterns as described in the specification, due to the lack of axes labeling. Applicants have amended the figures by providing the appropriate labels based on the specification, such as lines 1-7 of paragraph 90. With the changes, Applicants submit that the objections have been overcome.

112 Rejections

Claim 23 was rejected under 35 U.S.C. 112, first paragraph, as allegedly failing to comply with the enablement requirement because (a) "[T]he disclosures of Zabolotskaya et al. and Kuznetsov, cited in the specification, are not exemplary regarding the KZK equation" and (b) "[i]t is not commonly known in the art that increasing the frequency

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will result in increasing beam widths and therefore the specification is not enabling for one of ordinary skill in the art” Applicants respectfully disagree.

The KZK equation is well-established law in the field of non-linear acoustics. A Google search of the term, “KZK equation”, reveals more than 600 citations. One can get the KZK equation from numerous references, for example, one being the one cited in the application, such as Equation 20 in “Equations of nonlinear acoustics,” by V.P. Kuznetsov, in lines 14-15 of paragraph 89 of the specification. Applying the KZK equation to get numeral results and then generating graphs from those numeral results should not be considered as skills beyond those of ordinary skill in the art. As shown in Figures 9E, 9F and 9G, the beam widths of the beam at 40 kHz carrier frequency (Figure 9E) is narrower than the beam widths of the beam at 100 kHz carrier frequency (Figure 9F), which in turn is narrower than the beam widths of the beam at 200 kHz carrier frequency (Figure 9G). Thus, Applicants submit that claim 23, which claims increasing the ultrasonic frequency of the ultrasonic signals to increase the width of the beam, fully satisfies the enablement requirement under 35 U.S.C. 112.

102(e) Rejections under Takahashi

Claims 1-6, 9 and 10 were rejected under 35 U.S.C. 102(e) as being anticipated by Takahashi et al (US Pat. No. 6,643,377, hereinafter known as “Takahashi”). Applicants respectfully disagree.

Takahashi does not teach or suggest its apparatus having a beam-attribute control unit that can control a width of the ultrasonic output of a directional speaker so that the beam width of the ultrasonic output can be changed.

The Office Action cited col. 5, lines 16-20 in Takahashi and alleged that they taught controlling the width of ultrasonic output. Applicants respectfully disagree. At best that section of Takahashi teaches the main body of each of its speaker can be rotated by 180 degrees, with the rotation controlled by a portable device 702. A listener can push a switch 703 on the device to emit a rotation signal from a light emitting unit 701. A photosensor unit 404 in the base member 401 of the speaker 402 captures the signal and rotates the speaker by 180 degrees.¹ There is no teaching or suggestion in Takahashi of

¹ Col. 4, line 44 to col. 5, line 20 of Takahashi.

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any change in the beam width of its ultrasonic signals, let alone a unit that can change the beam width of ultrasonic signals. Thus, Applicants submit that claim 1, and its dependent claims 2-6, 9 and 10 are patentably distinct from Takahashi.

102(b) rejection under Breed

Claims 1, 13 and 14 were rejected under 35 U.S.C. 102(b) as being anticipated by Breed et al (US Pub. No. 2001/0038698, hereinafter referred to as "Breed"). Again Breed does not teach or suggest its apparatus having a beam-attribute control unit, let alone a beam-attribute control unit that can electronically control a beam width of the ultrasonic output of a directional speaker so that the beam width of the ultrasonic output can be changed, as in Applicants' claim 1. Thus, Applicants submit that claim 1, and its dependent claims 13 and 14, are patentably distinct from Breed.

In addition, Breed teaches audio reception control for a vehicle. There is no teaching or suggestion of an environmental adjustment unit configured to modify the audio signals or the ultrasonic signals in accordance with a piece of information related to the environment in the vicinity of a portable device used by a user, as in Applicants' claim 13. Thus Applicants submit that claim 13 and its dependent claim 14 are further patentably distinct from Breed.

102(b) rejection under Norris

Claims 16-22 were rejected under 35 U.S.C. 102(b) as being anticipated by Norris et al. (US Pub. No. 2001/0055397, hereinafter known as "Norris"). Applicants respectfully disagree.

Norris teaches virtual sound sources from a reflective environment, such that the sound sources are perceived by a listener as original sound sources.² However, Norris does not teach or suggest controlling a reflector associated with a directional speaker, let alone a beam attribute input controlling a reflector associated with the directional speaker, as recited in Applicants' claim 16. Thus, Applicants submit that claim 16, together with its dependent claims 18-22 are patentably distinct from Norris.

² See Abstract in Norris.

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In addition, Norris does not teach or suggest selecting between directionally-constrained audio and conventional audio, as in Applicants' claim 21. In Norris, the outputs from conventional speakers 30 are synchronized with outputs from ultrasonic speakers (20, 21, 22) such that a listener hears a coordinated enveloping sound experience from multiple directions. In other words, both types of sources are selected together. There is no teaching or suggestions of selecting one of them, as in Applicants' claim 21.

Further, Norris teaches sending different ultrasonic beams from different ultrasonic speakers (20, 21, 22) to generate sound effects from a plurality of directions. This is different from a directional speaker with a plurality of segments such that the segments can be individually controlled for emitting the directionally constrained audio, as in Applicants' claim 22.

103 rejections under Takahashi and Norris

Claims 7, 8 and 15 were rejected under 35 U.S.C. 103 as being unpatentable over Takahashi in view of Norris. Applicants respectfully disagree.

With both Takahashi and Norris not teaching or suggesting the base claim 1, both references could not have taught or suggested the dependent claims 7, 8 and 15, singly or in any combination.

Further, Norris teaches three separate speakers (20, 21, 22) generating three separate beams. This is distinctively different from a directional speaker with a curved surface, as in Applicants' claim 8.

Also, independent of how many times Norris teaches its sound waves being reflected, the sounds waves are reflected in free space where the listener is positioned. Thus, as to a reflecting surface, Norris teaches, "a side wall of a room or other enclosure wherein the listener is positioned. Ceiling floor and front and back walls can also be used."³ This is distinctly different from ultrasonic output being reflected by at least one reflecting surface, before propagating into the free space where a user of the apparatus is positioned, as directionally-constrained audio output, as in Applicants' claim 15.

³ See lines 5-7 of paragraph 15 in Norris.

PATENT103 rejections under Takahashi and Obradovich

Claims 11 and 12 were rejected under 35 U.S.C. 103 as being unpatentable over Takahashi in view of Obradovich (US Pub. No. 2002/0008718). Applicants respectfully disagree.

Obradovich describes a control and management system for automobiles combining unrelated subsystems together to realize synergistic functions, such as smart driving and automatic parking.⁴ Obradovich does not teach or suggest numerous features in, for example, independent claim 1, such as a directional speaker that outputs an ultrasonic output.

With both Takahashi and Obradovich not teaching or suggesting the base claim 1, both references could not have taught or suggested the dependent claims 11 and 12, singly or in any combination.

103 rejections under Takahashi and Breed

Claims 13 and 14 were rejected under 35 U.S.C. 103 as being unpatentable over Takahashi in view of Breed. Applicants respectfully disagree.

With both Takahashi and Breed not teaching or suggesting the base claim 1, both references could not have taught or suggested the dependent claims 13 and 14, singly or in any combination.

103 rejections under Norris and Pompei

Claim 23 was rejected under 35 U.S.C. 103 as being unpatentable over Norris in view of Pompei (Journal of the Audio Engineering Society). Applicants respectfully disagree.

With no teachings or suggestions in Norris regarding increasing the ultrasonic frequency to increase the width of the beam, the Office Action tried to remedy the deficiencies by introducing Pompei. The Office Action argued that Pompei allegedly teaches that when the frequency of the ultrasonic carrier signal is increased, the width of the beam increases; and cited Figure 8 in Pompei as support. Applicants again respectfully disagree.

⁴ See Obradovich's abstract.

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There is no teaching or suggestion in Pompei of converting audio signals to ultrasonic signals for providing directional constrained audio.

As to Pompei's Figure 8, Pompei explains some measured results regarding its audio sound. In Pompei, the measured results are for audio frequencies ranging from 400 Hz to 16 KHz. They are not measurements of ultrasonic signals generated from audio signals.

In addition, Figure 8 introduces some contradictory measurements. In its Figures 8a to 8e, as its audio sound increases in frequencies from 400 Hz to 8 kHz, the beam width of its audio sound seems to be broadening. However, as its audio sound further increases from 8 kHz to 16 kHz, the beam width of the audio sound narrows.

Claim 23 claims an attribute input being configured to increase the ultrasonic frequency of the ultrasonic signals to increase the width of the beam of the directionally constrained audio. This is non-obvious based on the KZK equation. "One explanation can be that higher acoustic attenuation reduces the length of the virtual array of speaker elements, which tends to broaden the beam pattern."⁵ This non-obvious feature can be used, for example, to achieve better beam isolation as well as to enhance privacy.

With Norris and Pompei not teaching or suggesting numerous limitations in Applicants' independent claim 16 and its dependent claim 23, claim 23 is patentably distinct from Norris and Pompei.

Regarding the remaining reference cited by the Examiner, since it has not been applied against any of the claims and do not appear properly applicable thereto, no further mention thereof will be made.

It is submitted that the abstract is no longer objectionable. In addition, it is submitted that claims 1-3, 5-16 and 18-24 are patentably distinct from the cited references. Reconsideration of the application and an early Notice of Allowance are earnestly solicited. If there are any issues remaining which the Examiner believes could be resolved through either a Supplemental Response or an Examiner's Amendment, the


⁵ The second to the last sentence in paragraph 90 of Applicants' specification.

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Examiner is respectfully requested to contact the undersigned representative at the telephone number listed below.

Respectfully submitted,

5150 El Camino Real
Building A, Suite 22
Los Altos, CA 94022
(650) 903-9200 ext 102

By: 
Peter P. Tong
Registration No.: 35,757